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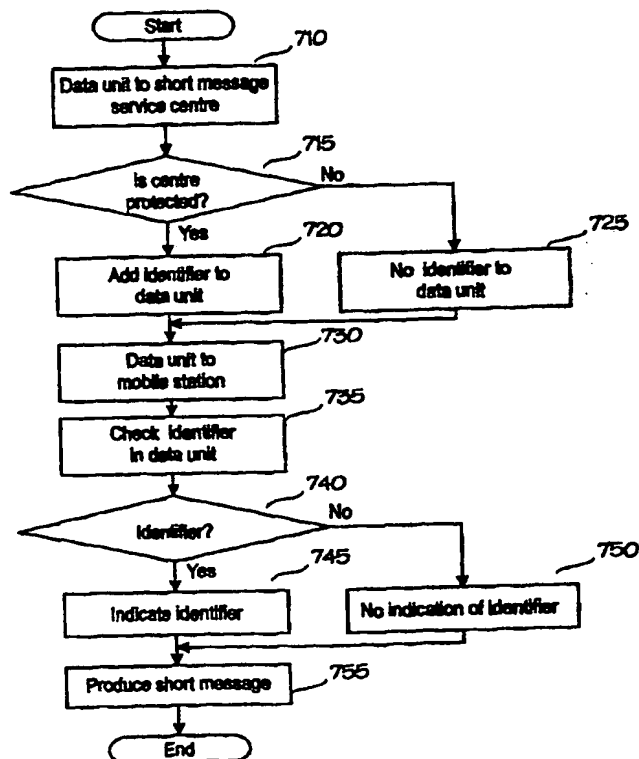
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(21) International Application Number: PCT/FI99/00013 (22) International Filing Date: 11 January 1999 (11.01.99) (30) Priority Data: 980051 13 January 1998 (13.01.98) FI (71) Applicant (for all designated States except US): NOKIA TELECOMMUNICATIONS OY [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): MEURONEN, Timo [FI/FI]; Vilniementie 10 D 32, FIN-02940 Espoo (FI). (74) Agent: KOLSTER OY AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published Without international search report and to be republished upon receipt of that report.

(54) Title: MOBILE COMMUNICATION SYSTEM WHICH TRANSMITS SHORT MESSAGES

(57) Abstract

The object of the invention is to provide a method and an apparatus implementing the method which allow the subscriber to evaluate the authenticity of sender data in an incoming short message. Short message service centres are arranged to add an identifier containing information on whether the identity of the sender of a message transmitted by the short message service centre is guaranteed to data units containing a short message. If the data unit containing the short message comprises said identifier, the subscriber's terminal indicates the information included in the identifier to the subscriber.



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**MOBILE COMMUNICATION SYSTEM WHICH TRANSMITS SHORT MESSAGES****BACKGROUND OF THE INVENTION**

The invention relates to mobile communication systems and particularly to a method of producing a short message in a mobile communication system and an apparatus implementing the method. The method comprises the steps in which a data unit containing a short message is sent from a short message service centre to a terminal and the received short message is indicated by means of the terminal.

In addition to normal speech and data connections set up on the traffic channels in digital mobile communication systems, short digital data messages, transferred on the control and signalling channels of the system, may be sent amid actual signalling. These messages are generally called short messages. A short message service centre is typically added to a mobile communication system for producing short messages. The short message service centre forwards short messages as well as stores and retransmits messages whose delivery has failed. The short message service centre can be arranged to receive short messages via any network. In the case of a terminal-originating short message the subscriber creates the short message using the terminal's keyboard, and the terminal sends the short message on a signalling channel to the short message service centre via the base station and mobile switching centre. The short message service centre transmits the short message on signalling channels via the mobile communication network to another subscriber's terminal or to another destination.

The address of the element that has sent a short message is displayed to a subscriber who has received the short message in the message, the address being typically the sender's MS-ISDN number. In a way, the number functions as the signature of the message and allows the receiver to conclude the identity of the message's sender. In some less advanced short message service centres the sender's number can be processed through an application program interface, and thus the system enables sending of short messages using a wrong identity.

In some short message service centres, such as NOKIA SMSC, it is impossible to forge the sender's identity. However, since the subscriber can receive messages from several different short message service centres, in which the routines of checking the quality may differ considerably, there is a

clear need for improving identification of the sender of a short message.

Sender identification is extremely important in any kind of communication. The use of a wrong identity enables misleading and disruptive communication, which may in certain cases be highly detrimental to the receiver. Since the number and selection of services provided for the subscriber via short messages increases constantly, more and more attention should be paid to the prevention of misuse.

#### BRIEF DESCRIPTION OF THE INVENTION

The object of the invention is to provide a method and an apparatus implementing the method which allow a subscriber to evaluate the authenticity of sender data in an incoming short message.

The objects of the invention are achieved with a method of producing a short message in a mobile communication system according to claim 1. The method comprises the steps in which a data unit containing a short message is sent from a short message service centre to a terminal and the received short message is indicated by means of the terminal. The method is characterized in that an identifier containing information on whether the identity of the sender of a message sent via the short message service centre is guaranteed is added to the data unit containing the short message, and the identifier's information on whether the identity of the sender of the message sent via the short message service centre is guaranteed is indicated to the subscriber in response to the fact that the data unit containing the short message comprises said identifier.

The invention also relates to a mobile communication system which transmits short messages according to claim 5. The system comprises at least one short message service centre for transmitting short messages and one or more terminals for indicating short messages. The mobile communications system is characterized in that the short message service centre is arranged to add an identifier containing information on whether the identity of the sender of the message sent via the short message service centre is guaranteed to said data unit containing the short message, and the terminal is arranged to indicate the identifier's information on whether the identity of the sender of the message sent via the short message service centre is guaranteed to the subscriber in response to the fact that the data unit containing the short message comprises said identifier.

The invention further relates to a short message service centre functioning in a mobile communication system according to claim 9. The short message service centre is characterized in that it is arranged to add an identifier containing information on whether the identity of the sender of the message sent via the short message service centre is guaranteed to said information unit containing the short message.

In addition, the invention relates to a terminal in a mobile communication system according to claim 13, the terminal comprising means for receiving short messages. The terminal is characterized in that it is arranged to indicate the identifier's information on whether the identity of the sender of the message sent via the short message service centre is guaranteed or not to the subscriber is response to the fact that the data unit containing the short message comprises said identifier.

The preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on the idea that short message service centres are arranged to add an identifier containing information on whether the function of the short message service centre is guaranteed or not in respect of the sender's identity to the data unit containing the short message. If the sender's identity can be for example manipulated through an application program interface, the short message service centre cannot be considered protected. If the identity of the sender of short messages delivered via a short message service centre can be guaranteed in each case, the short message service centre can be considered protected. Said identifier can be produced in a manner which can be selected on the basis of the application. Some of these ways will be described in greater detail in the following, without restricting the invention to these embodiments.

The method and system of the invention have the advantage that they provide the subscriber with an easy way of evaluating the authenticity of the sender data in an incoming short message.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings, in which

Figure 1 illustrates basic structural parts of the GSM system which participate in delivering a mobile-terminating short message according to the prior art;

Figure 2 is a block diagram illustrating a mobile station MS  
5 according to the prior art;

Figure 3 is a block diagram illustrating a short message service centre SMSC according to the prior art;

Figure 4 illustrates a protocol architecture used in transferring short messages according to the GSM specifications and also provides a detailed  
10 view of some elements used for describing the embodiment;

Figure 5 illustrates the structure of a TP-OA element;

Figure 6 illustrates the structure of an address type;

Figure 7 is a flow chart illustrating the method of the invention; and

Figure 8 is a signalling chart illustrating a short message function  
15 according to the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

In the following, the invention will be described using the short message service of the GSM system (Global System for Mobile Communications) as an example. However, the invention is not restricted to  
20 the GSM system but may be applied in other systems employing a similar message service, for example in systems according to the DCS1800 (Digital Communication System), PCN (Personal Communication Network) and TETRA (Trans-European Trunked Radio) standards and in the third generation mobile communication systems that are under development.

Figure 1 illustrates the basic structural parts of the GSM system which participate in the delivery of a mobile-terminating short message. The structure of the GSM network consists of two parts: a base station subsystem BSS and a network subsystem NSS. The BSS and mobile stations MS communicate using radio connections. The operation of a mobile station  
30 according to the invention is explained more closely in connection with Figure 2. In the base station subsystem BSS each cell is served by a base transceiver station BTS. The base transceiver stations BTS are usually connected to a base station controller BSC as groups of several base transceiver stations. The base station controller controls the radio frequencies  
35 and radio channels used by the base transceiver station BTS. The base

station controllers BSC are connected to a mobile switching centre MSC, which switches calls in which at least one mobile station MS is involved. Some mobile switching centres MSC are connected to other telecommunications networks (not shown in the figure), such as the public switched telephone network PSTN, and they comprise connection functions for switching calls to and from these networks. In the short message service the mobile switching centre MSC transmits a short message it has received either to a mobile station MS or to a short message service centre SMSC.

Two types of data bases are involved in call routing. One of these is called a home location register HLR, in which data on each subscriber in the network is stored either permanently or semi-permanently, including information on the services to which the subscriber has access and the subscriber's present location. The other data base is called a visitor location register VLR. The visitor location register VLR is usually connected to one mobile switching centre MSC, but it may also serve several centres. When a mobile station MS is active (i.e. it is registered with a network and may initiate or receive a call), most of the subscriber data on the mobile station MS in the home location register HLR are loaded (copied) to the visitor location register VLR of the mobile switching centre MSC in whose area the mobile station MS is. The home location register and visitor location register are used for routing short messages in a mobile communication network substantially in the same way as for routing calls.

For the short message service the system comprises a short message serving centre SMSC and a short message service gateway SMSGW. The short message service centre SMSC will be described in greater detail later in connection with Figure 3. The short message service gateway SMSGW is the common name for a centre transmitting short messages to a mobile station (the gateway mobile switching centre for short message service) SMS-GMSC and a centre transmitting mobile-originating short messages (interworking mobile switching centre for short message service) SMS-IWMSC. The SMS-GMSC receives a short message from the short message service centre SMSC, requests routing information from the home location register HLR and transmits the short message to a mobile station MS via the mobile switching centre MSC. Correspondingly, the SMS-IWMSC may receive short messages from the mobile station and transmit them further to the short message service centre SMSC.

The short message entity SME may be any device by means of which short messages can be sent and/or received. The short message entity may be located in a mobile station, short message service centre or in a fixed network.

5           Short messages are transmitted on the control channel, i.e. the signalling channel, amid actual signalling. The GSM system uses either a stand alone dedicated control channel SDCCH or a slow associated control channel SACCH for transmitting short messages. The last-mentioned is used when the mobile station has a connection on the traffic channel, in other words  
10       the mobile station is engaged in a call, for example.

          Figure 2 is a block diagram illustrating a mobile station MS of the invention. In the GSM system the mobile station consists of the actual terminal and of a subscriber identity module SIM, which is attached to the mobile station so that it can be removed. The SIM card used as the subscriber identity  
15       module in the GSM system is a smart card which is to be inserted into a mobile station and contains data on identification of a subscriber, such as international mobile subscriber identity number IMSI and a certain amount of memory M2 for storing short messages received by the mobile station. The actual terminal comprises a transceiver Tx/Rx and its antennas, user interface  
20       UI, controller CP and memory M1, a certain amount of which is reserved for storing short messages. Thus the memory of the mobile station comprises two parts, i.e. the memory M1 of the terminal and the memory M2 of the SIM card.

          The user interface UI usually comprises a keyboard, display, loudspeaker and microphone, which are not shown in Figure 2. By means of  
25       the user interface UI the user may write, send, read, delete and rewrite short messages and give other directions to the controller CP.

          The controller CP receives e.g. the above-mentioned inputs related to short messages from the user interface. The controller CP may indicate to the mobile MS user that the mobile station has received a short message via  
30       the user interface UI by a signal and by a message or a symbol which appears on the display. The controller CP may also give signals, textual instructions or instruction symbols related to the operation of the mobile station and/or the mobile communication system to the mobile subscriber via the user interface.

          Figure 3 is a block diagram illustrating a short message service  
35       centre SMSC of the invention. The short message service centre SMSC comprises an interface part L1 for receiving and sending short messages via



the short message service gateway SMSGW from/to a mobile station in a mobile communication system. The short message service centre SMSC may comprise interface parts L2 (only one of these is shown in the figure) for connecting the short message service centre to other networks, such as PSTN, and/or to answering services connected directly to the short message service centre. These interface parts are used for sending and receiving short messages or other messages, such as e-mail messages, from which short messages are formed or which are formed from short messages in the corresponding interface parts L1, L2. In addition, the short message service centre comprises a transfer part RP which transfers the short message received by the short message service centre SMSC for further delivery. The transfer part RP also stores a short message which could not be delivered in its memory M and retrieves it according to the directions from the memory when the delivery of the short message succeeds. Furthermore, the short message service centre may comprise a message generation part GP for generating short messages according to the directions received from the answering service, for example.

Figure 4 illustrates a protocol architecture used for transferring short messages according to the GSM specifications and also provides a detailed view of some elements used for describing the embodiment. In the GSM system, the short message transfer layer protocol SM-TP is a protocol related to the TL layer between the short message service centre SMSC and the mobile station MS. The SMS-DELIVER data unit (Transfer Protocol Data Unit, TDPU) of this protocol transfers a short message from the short message service centre to the mobile station, and the SMS-SUBMIT data unit correspondingly transfers the short message from the mobile station to the short message service centre. The SMS-DELIVER data unit substantially comprises a UD basic element (User Data), which transmits the actual short message. In the solution of the invention identity information is included in the data unit to be transferred in the form of a short message, and the information is transmitted to the mobile station MS in the short message. On the basis of said identity information the terminal may provide the subscriber with indication of whether the short message originates from a short message service centre in which the message's original sender cannot be manipulated.

The SMS-DELIVER data unit comprises a TP-OA basic element which consists of 2 to 12 bit octets and includes the address of the short

message entity that has sent the short message. Figure 5 illustrates the structure of the TP-OA element (TP-Originating-Address) which comprises the following parts: address length, type of address and address value. The address length is an integer which is expressed with one bit octet and  
5 indicates the length of the Address Value field.

From the structure of the address type illustrated in Figure 6 it appears that this element comprises a Type of Number field with a length of three bits and a Numbering Plan Identification field with a length of four bits. There are several bit combinations defined for each field, and on the basis of  
10 these combinations the number data included in the Address Value field of the source address can be interpreted.

The present invention is based on the idea that an identifier which indicates to the receiver of a short message whether the identity of the sender of the incoming message is guaranteed or not is added to the data unit which  
15 transfers the short message. In the preferred embodiment of the invention the identifier consists of a bit or a bit map which is defined for and added to the Type of Number field or Numbering Plan Identification field and reserved particularly for this purpose. Only the short message service centres SMSC that do not allow to manipulate the identity of the sender of the short message  
20 sent by them can incorporate said bit map into said field.

A message sent by the short message service centre SMSC is transferred to the mobile communications network via the short message service centre gateway SMS-GMSC and further to the terminal MS over the radio interface. The terminal receives a data unit by means of the transceiver  
25 Tx/Rx, and the unit is transferred to the terminal controller CP. According to the invention, the terminal MS, preferably its controller CP, is arranged to identify said bit map from the Type of Address field and to control the operation of the terminal according to the identification. The way in which the indication is provided for the subscriber is an application-specific solution and  
30 may be selected separately for each terminal. The controller CP may be arranged to control the display included in the user interface UI so that it shows a certain symbol to the subscriber. The subscriber can conclude from this symbol whether the message sender's identity is guaranteed or not. Thus the subscriber may decide separately in each case whether he should doubt  
35 the authenticity of the message. The indication may also be a deviating signal for short message or a verbal indication which is shown on the display

together with the message (e.g. "SUBSCRIBER NOT GUARANTEED"). The indication may also be an additional function of the terminal MS, which an educated subscriber and/or a subscriber who uses the short message service frequently may optionally utilize in his terminal.

5           The embodiment described above employed a bit map included in the TP-OA basic element as the identifier. The selection of the identifier is an application-specific solution which can be implemented in the chosen manner. In the GSM system, for example, the identifier may be implemented in the same way by defining a bit map either for a PID basic element (TP-Protocol  
10 Identifier) or for the user data header of the UD basic element (User Data). It is essential that the identifier is included in the data unit that transmits the short message and is thus transferred to the terminal MS in the data unit, the terminal being arranged to recognize the identifier and to operate in the manner indicated by the identifier.

15           The flow chart of Figure 7 illustrates the method of the invention. In step 710 the short message service centre SMSC receives a data unit containing a short message. If the short message service centre SMSC is a protected short message service centre (step 715), in other words, the sender's address received via the centre cannot be manipulated by the  
20 sender, the centre can add an identifier indicating the centre's reliability level to the data unit containing the short message (step 720). If the centre is not protected, an identifier cannot be added to the data unit (step 725). After this, the data unit containing the short message is delivered to the terminal in the usual manner (step 730). The terminal's controller CP checks whether the  
25 received data unit contains an identifier indicating protection (step 740). If the identifier is found, the control unit can indicate that the short message service centre that has sent the incoming message is protected by providing a symbol indicating protection on the terminal display, for example (step 745). If no identifier is found in the data unit, protection cannot be indicated (step 750).  
30 After this, the short message function continues in the usual manner (step 755). Indication of protection does not need to be a separate function but it may also be implemented in connection with the display of a short message.

          The signalling chart illustrated in Figure 8 describes implementation of the method of the invention in connection with the short message function.  
35 Signal 8.1. represents a data unit which contains a short message and is transferred to the short message service centre SMSC by the short message

entity SME. In the GSM environment described above the data unit is the SMS-SUBMIT message of the Transfer Protocol layer. In step 8.2 the protected short message service centre SMSC adds an identifier indicating protection to the data unit. The identifier can be produced for example by  
5 means of the bit map arranged in the TP-OA element, as was described above. After this, the delivery of the short message continues in the manner described above through the mobile communication network (signals 8.3 to 8.7). When the data unit enters the terminal MS, the terminal's control unit checks whether the data unit contains the selected identifier indicating that the  
10 short message service centre is protected. If the data unit contains the identifier and the subscriber's terminal allows indication, the subscriber is informed of the fact that the short message service centre SMSC that has sent the message is protected.

In the above examples the identifier is added to the short message  
15 service centres that can guarantee the identity of the sender of the short message. However, it could also be defined that an identifier is added to data units containing a short message only in such short message service centres that cannot guarantee the sender's identity, in which case indication would naturally show that the short message originates from a short message service  
20 centre which cannot guarantee the sender's identity. It should be understood that the above description and the related drawings are only intended to illustrate the present invention. Thus it is obvious to a person skilled in the art that the invention may be varied and modified in different ways without deviating from the scope and inventive concept disclosed in the appended  
25 claims.

## CLAIMS

1. A method of producing a short message in a mobile communication system, the method comprising the steps of:
- 5 sending a data unit containing a short message from a short message service centre (SMSC) to a terminal (MS);
- indicating the received short message by means of the terminal,  
**characterized by**
- adding an identifier containing information on whether the identity of the sender of a message sent via the short message service centre is guaranteed to said data unit containing the short message;
- 10 indicating the identifier's information on whether the identity of the sender of the message sent via the short message service centre is guaranteed to the subscriber in response to the fact that the data unit containing the short message comprises said identifier.
- 15 2. A method according to claim 1, **characterized** by using a selected bit combination included in a TP-OA basic element (TP-Originating Address) as the identifier.
3. A method according to claim 2, **characterized** by using a selected bit combination included in the Type of Address structural part of the
- 20 TP-OA basic element (TP-Originating Address) as the identifier.
4. A method according to claim 2, **characterized** by using a selected bit combination included in the Numbering Plan Identification structural part of the TP-OA basic element (TP-Originating Address) as the identifier.
- 25 5. A mobile communication system which transmits short messages and comprises at least one short message service centre (SMSC) for transmitting short messages and one or more terminals (MS) for indicating short messages, **characterized** in that
- the short message service centre (SMSC) is arranged to add an
- 30 identifier containing information on whether the identity of the sender of a message sent via the short message service centre is guaranteed to said data unit containing the short message; and
- the terminal (MS) is arranged to indicate the identifier's information on whether the identity of the sender of the message sent via the short

message service centre is guaranteed to the subscriber in response to the fact that the data unit containing the short message comprises said identifier.

5           6. A mobile communication system according to claim 5, **characterized** in that the identifier consists of a bit combination included in a TP-OA basic element (TP-Originating Address).

          7. A mobile communication system according to claim 6, **characterized** in that the identifier consists of a selected bit combination included in the Type of Address structural part of the TP-OA basic element (TP-Originating Address).

10          8. A mobile communication system according to claim 6, **characterized** in that the identifier consists of a selected bit combination included in the Numbering Plan Identification structural part of the TP-OA basic element (TP-Originating Address).

          9. A short message service centre (SMSC) functioning in a mobile  
15 communication system, **characterized** in that the short message service centre (SMSC) is arranged to add an identifier containing information on whether the identity of the sender of a message sent via the short message service centre is guaranteed to said data unit containing the short message.

          10. A short message service centre (SMSC) according to claim 9,  
20 **characterized** in that the identifier consists of a bit combination included in a TP-OA basic element (TP-Originating Address).

          11. A short message service centre (SMSC) according to claim 10, **characterized** in that the identifier consists of a selected bit combination included in the Type of Address structural part of the TP-OA basic  
25 element (TP-Originating Address).

          12. A short message service centre (SMSC) according to claim 10, **characterized** in that the identifier consists of a selected bit combination included in the Numbering Plan Identification structural part of the TP-OA basic element (TP-Originating Address).

30          13. A terminal in a mobile communication system, the terminal comprising means for receiving short messages, **characterized** in that the terminal (MS) is arranged to indicate the identifier's information on whether the identity of the sender of the message sent via the short message service centre is guaranteed to the subscriber in response to the fact that the data unit  
35 containing the short message comprises said identifier.

13

14. A terminal according to claim 13, **characterized** in that the indication is a symbol which is provided on the display of the terminal (MS).

5 15. A terminal according to claim 13 or 14, **characterized** in that said indication is an optional additional function.

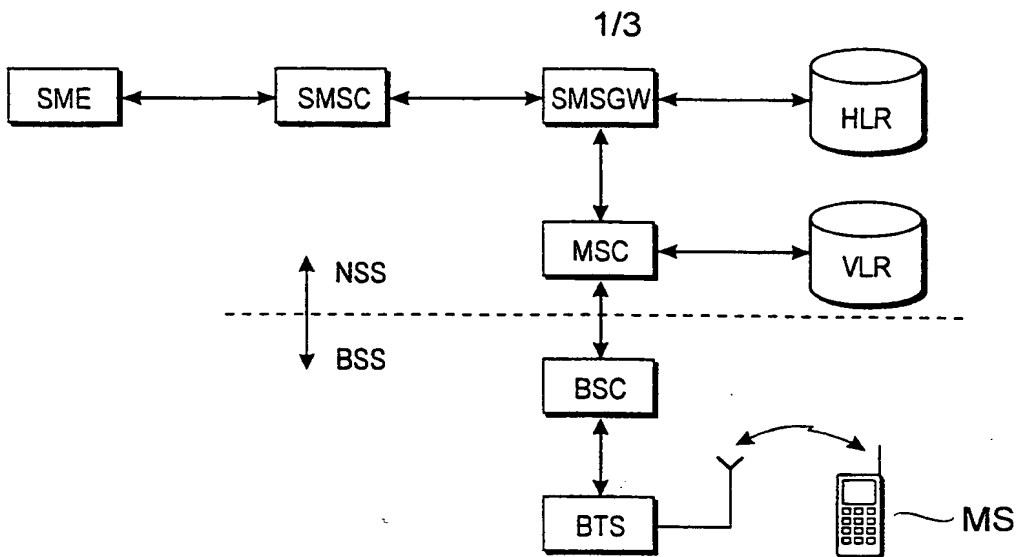


Fig. 1

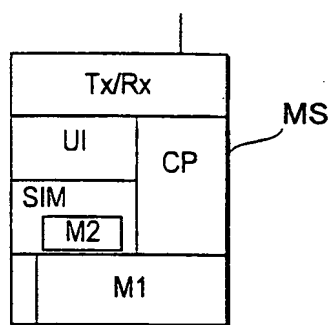


Fig. 2

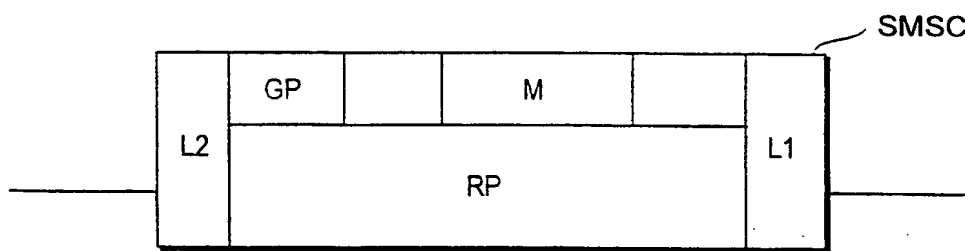


Fig. 3

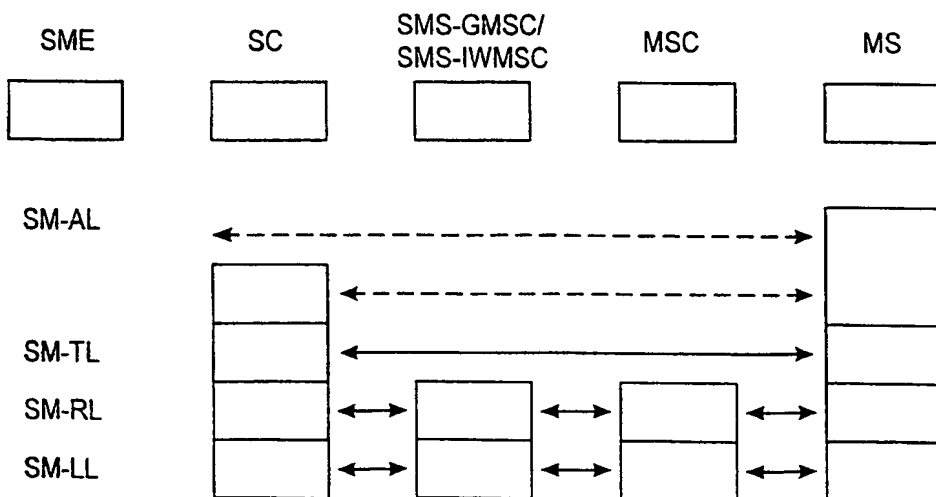


Fig. 4



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Fig. 5

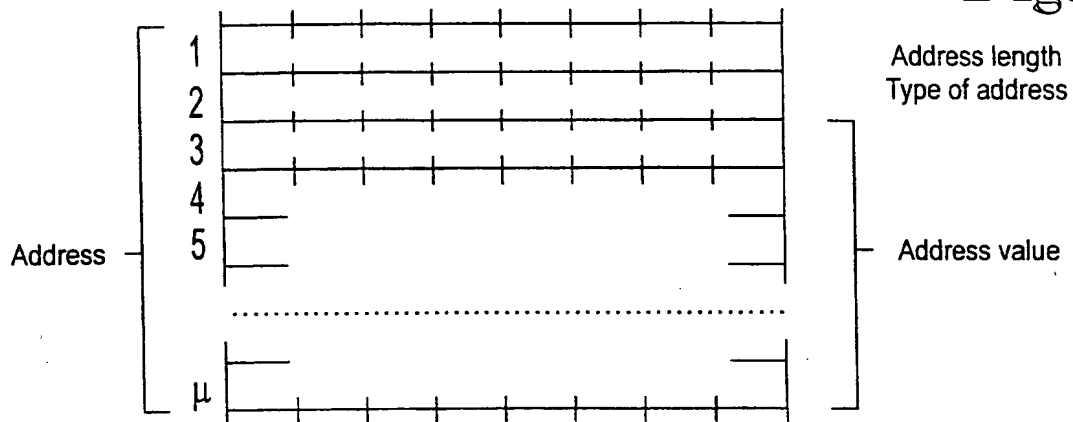


Fig. 7

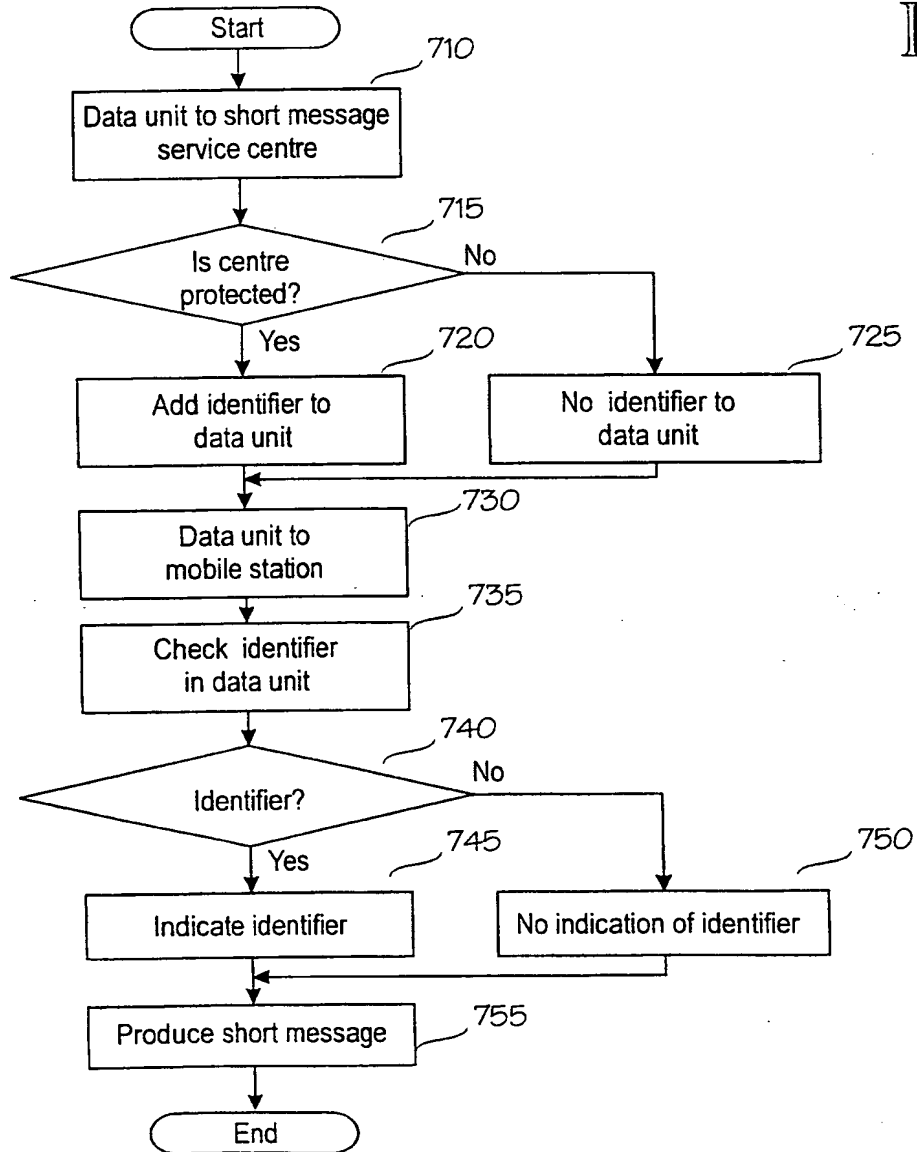


Fig. 6

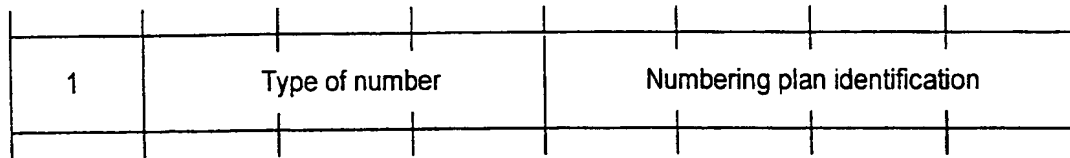
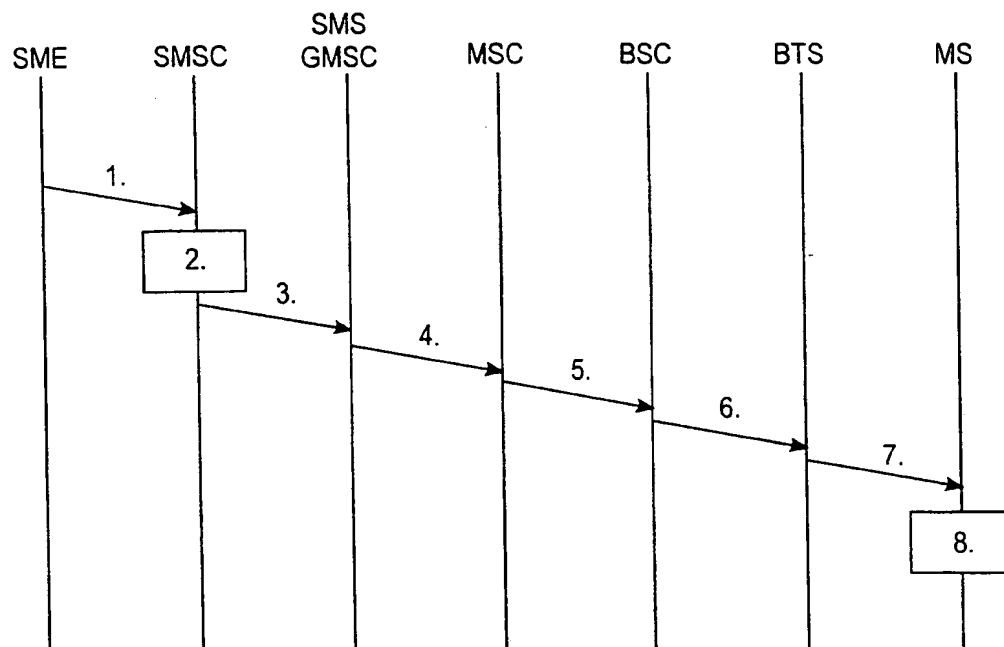


Fig. 8



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